3.6. chain rule for parametric equations

$x(t) = \cos t$

$y(t) = \sin t$

$\frac{dy}{dx} = ?$ $\quad \frac{dy/dt}{dx/dt}$

t is the parameter

$$\frac{dy}{dt} = \frac{dy}{dx} \cdot \frac{dx}{dt}$$

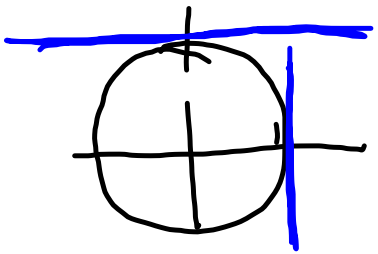
$$\frac{dy}{dx} = \frac{dy/dt}{dx/dt}$$

parametric eqns.

circle $x = \cos t$ $y = \sin t$

$$\frac{dy}{dx} = \frac{\cos t}{-\sin t} = -\cot t$$

slope at $t = \frac{\pi}{2}$ $\frac{dy}{dx} = \frac{0}{-1} = 0$



slope at $t = 0$ is $\frac{1}{-0}$

EX 6 $x = \sec t$, $y = \tan t$

at $t = \frac{\pi}{4}$ $(\sqrt{2}, 1)$ $\quad -\frac{\pi}{2} < t < \frac{\pi}{2}$

$$\frac{dy}{dx} = \frac{\sec^2 t}{\sec t \tan t} = \frac{\sec t}{\tan t}\Bigg|_{t=\frac{\pi}{4}} = \frac{\sqrt{2}}{1}$$

tan line

$$y = \sqrt{2}\left(x - \sqrt{2}\right) + 1$$